

I. Executive Summary

DNR WAREHOUSE

a. **Stone Lakes Water hyacinth Control**

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Applicant: Bryan J. Young, Sacramento Regional County Sanitation District

b. **Project Description and Primary Biological/Ecological Objectives**

The Stone Lakes water hyacinth control effort, led by the Sacramento Regional County Sanitation District (SRCSD), is an ongoing project intended to eradicate water hyacinth from the Stone Lakes Basin and prevent the expansion of this destructive weed. The Stone Lakes Water Hyacinth Control Group (SLWHCG), comprised of government agencies, land owners and local businesses, operated in 1996 and 1997 through Sacramento County emergency funds and contributions from group members. While SLWHCG efforts have substantially reduced hyacinth in the Basin, complete eradication would require the group to continue the program for at least three more years.

The hyacinth now occupying the Stone Lakes Basin, if left unchecked, could potentially expand from 30 acres to 240 acres in 30 to 45 days (Wolverton and McDonald 1978; Penfound and Earle 1948). However, SLWHCG efforts will result in the control, and possible eradication, of hyacinth in the Basin. After the competitive, dense hyacinth is removed, ecologically essential native plants upon which many organisms depend will return, and oxygen levels will substantially increase. Our hyacinth control efforts aim to expand habitat, and increase food resources (e.g., invertebrates) for fish, including Sacramento splittail and striped bass, and migratory birds. Downstream fish species of concern and waterfowl will benefit indirectly due to the reduction of migrating hyacinth. The SLWHCG eradication program will continue to prevent the expansion of this fast-growing plant into habitats of concern including instream aquatic and shaded riverine aquatic which are in danger of being ecologically damaged and eventually lost due to the high siltation rates caused by this plant.

c. **Approach/Tasks/Schedule**

From 1998 to 2000 the SLWHCG will resume the integrated hyacinth control program which optimizes effectiveness while maintaining the lowest potential for environmental harm. Between March and October of each year two herbicidal chemicals and various hand-removal methods will be utilized to control/eradicate hyacinth.

Members of the local community, who are often unaware of the destructive potential of hyacinth, often inadvertently spread the plant. In April of 1998, SLWHCG will develop a color flyer which will describe the deleterious effects of hyacinth, offer advice on prevention of its dispersal, and present photos and identification characteristics. Throughout the Delta, bait shops, marinas, boat stores and aquatic plant retailers have pledged their assistance in dispersing the flyer. The U.S. Fish and Wildlife Service (USFWS) will also present displays and materials at weekend tours and annual public events at the Stone Lakes National Wildlife Refuge.

d. **Justification for Project and Funding by CALFED**

Prior to 1996, approximately 35% of the Stone Lakes Basin's water surface was covered with hyacinth. In 1996, SLWHCG staff treated five large mats which covered approximately 50 acres of the Southern Pacific Borrow Channel. The mats are now completely dissolved and plant density adjacent to the banks has been significantly decreased. It is now apparent that if the SRCSD portion of the program is funded, potential exists for the complete eradication of hyacinth in the Stone Lakes Basin.

e. **Budget Costs and Third Party Impacts**

Budget costs: The SRCSD is requesting \$433,620 from of the CALFED Category III program. This amount accounts for the required portion of the estimated \$675K necessary to continue the water hyacinth eradication effort in the Stone Lakes Basin for three years. Participants of the SLWHCG have agreed to contribute the balance, \$245K, of this total amount in labor and materials, if CALFED funding is provided to SRCSD.

Third Party Impacts: Crops growing adjacent to chemical treatment areas can potentially be impacted by irrigation water contamination or herbicidal drift. The SLWHCG will avoid such impacts

by maintaining no-spray zones around irrigation diversions, and by using drift control agents or pressure reduction methods when wind conditions may cause chemical drift. When winds are strong, and drift cannot be abated, chemical application operations will cease.

f. Applicant Qualifications

The SRCSD applicant, Bryan J. Young, is a licensed Pest Control Advisor and State Certified Applicator for aquatic situations. In addition to supervising a successful SRCSD water hyacinth eradication program and developing numerous integrated pest management programs for other noxious weeds, he has acted as the SLWHCG project coordinator for over two seasons. Other members of the SLWHCG have special qualifications and experience related to hyacinth control.

The majority of the program's activities will be performed by SRCSD employees working under the applicant's supervision. These employees have advanced training in safe and effective handling of herbicides, sensitive plant species recognition, and vegetation monitoring.

g. Monitoring and Data Evaluation

The hyacinth monitoring program will detect and verify subtle changes in plant cover as the plants are removed. Qualified research staff will perform daily semi-quantitative and bi-annual intensive quantitative evaluations of the treatment areas.

Using criteria standardized by the California Department of Boating and Waterways, work crews will rank the amount of hyacinth cover present in each treatment area on a daily basis, and prioritize work schedules according to results. Intensive quantitative sampling using permanent quadrats and line transects will be performed before and after each treatment season, allowing for statistical documentation of changes in percent plant cover over the project term. All data will be summarized and distributed to the funding agency and SLWHCG members for review and comments.

While hyacinth control evaluation is the primary focus of the monitoring program, long-term and short-term biological effects will also be monitored. Qualified research staff will collect water samples from treatment areas and have them analyzed for chemical residues. Invertebrate populations within treatment areas will be monitored before and after chemical application. 1) determining the rate at which herbicidal chemicals applied to hyacinth become undetectable, 2) determining whether a short-term impact on invertebrates (e.g., reduction) occurs post-treatment, and 3) determining whether a long-term effect on invertebrates (e.g. overall increase) occurs with time, after hyacinth removal. The results of the biomonitoring program will be statistically evaluated and submitted for review by the SLWHCG and the funding agency.

h. Local Support/Coordination with other Programs/ Compatibility with CALFED Objectives

The SLWHCG includes representatives of government agencies, local businesses and private landowners who are concerned with problems of hyacinth in Delta waters. The coordinated efforts of these twelve entities will ensure efficient and thorough removal of hyacinth. Eradication efforts are also coordinated with those of the California Department of Boating and Waterways (CDBW) which is attempting to control hyacinth in adjacent water bodies. Local support for the project is widespread, with land owners, agencies, and local businesses having much to gain from the eradication of this destructive weed. Letters of support are included in Appendix C. Local marinas, boat shops, and aquatic plant nurseries have volunteered to dispense educational materials.

The hyacinth eradication program meets CALFED goals by improving the long-term condition of essential aquatic habitats. Hyacinth may always exist within the waters of the Delta system; therefore, a standardized long-term eradication/monitoring policy is an essential component of the CALFED program. The results of this project will provide information which may be used to better manage other water hyacinth removal programs.

II. a. Stone Lakes Water Hyacinth Control

b. Applicant/Principal Investigator:

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c. Type of organization: County **Tax status:** Government

d. Tax identification number: 94-60000529

e. Technical and financial contact:

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f. Participants and collaborators: Stone Lakes Water Hyacinth Control Group, which includes:

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g. RFP project group type: Other Services

III. Project Description

a. PROJECT DESCRIPTION AND APPROACH

Project Description

The Stone Lakes water hyacinth control effort is an ongoing project intended to eradicate water hyacinth from the Stone Lakes Basin, and prevent the expansion of this destructive weed. The Stone Lakes Water Hyacinth Control Group (SLWHCG) includes representatives of government agencies, local businesses and private landowners who are concerned with the problems of hyacinth in Delta waters. The Sacramento Regional County Sanitation District (SRCSD) is currently operating as the lead agency for the project, with Natural Resource Specialist, Bryan J. Young, coordinating all efforts. The objective of this proposal is to sustain an ongoing effort to eradicate hyacinth from a 13,717-acre section of the Stone Lakes Basin by obtaining Category III funding for labor costs, equipment, materials, and chemical supplies.

The SLWCG operated in 1996 and 1997 principally through emergency funds appropriated by the Sacramento County Board of Supervisors, and supplemented by contributions from all members of the group. While this cooperative effort has resulted in an 85% reduction of hyacinth, the group requires funding to treat the remaining plants, monitor treatment effectiveness, and eventually eradicate hyacinth from the basin. With this funding, the SLWHCG will continue to treat hyacinth for at least three years, using methods developed during the first two years of the group's operations.

The costs and operations of the 1998 - 2000 control effort will again be shared by the eleven agencies and landowners. SLWHCG members have agreed to contribute \$245K of the \$675K needed to sustain the hyacinth eradication effort over the next three years, if CALFED provides the balance.

Intended Approach to the Problem of Water Hyacinth Invasion

- **Removal:** The SLWHCG operates an integrated program designed to optimize effectiveness while maintaining the lowest potential for environmental harm. Depending on the season, plant condition, and location, the SLWHCG utilizes two herbicidal chemicals and various hand-removal methods to control hyacinth (see **IIIe.** for expanded methods).

- **Education:** Members of the local community, often unaware of the destructive potential of hyacinth, may inadvertently spread the plant. If hyacinth is to be eradicated from the Stone Lakes Basin, transport of the weed into the area must be prevented. The SLWHCG will develop a flyer, modeled after a successful Florida Resource Conservation District flyer, describing the deleterious effects of hyacinth and offering advice on preventing its dispersal. Photos and identification characteristics will also be included. Throughout the Delta, bait shops, marinas, boat stores and aquatic plant retailers have pledged their assistance in dispersing the flyer. The U.S. Fish and Wildlife Service (USFWS) will present displays and materials at weekend tours and annual public events (e.g., Walk on the Wildside).

b. LOCATION AND GEOGRAPHIC BOUNDARIES OF PROJECT

The project is located within the Sacramento River watershed, north of the confluence of the Cosumnes River and Mokolumne River, in Sacramento County. Eradication will be performed on 250 acres of managed waters within the Stone Lakes Basin (Map 1). These waters include the Southern Pacific Railroad borrow channel and associated lakes and sloughs, and extend from the terminus of Morrison Creek, south to Lambert Road. The northern-most end of Stone Lakes Basin receives water from Morrison Creek; while at the southern end, the channel connects to the Snodgrass Slough system, which is linked to the Mokolumne Delta.

While the majority of the Basin is occupied by the Stone Lakes National Wildlife Refuge, other land owners include the USFWS, Department of Water Resources, Sacramento County Parks and Recreation Department, Caltrans, Sacramento Regional County Sanitation District, and private land owners.

c. EXPECTED BENEFITS

Primary: SLWHCG efforts will result in the control, and possible eradication, of hyacinth from the Stone Lakes Basin.

Secondary: While no hyacinth enters the Stone Lakes Basin from the north, the invasive plant migrates to the southern end, and spreads throughout the Delta, where eradication efforts by the California Department of Boating and Waterways (CDBW) are abated by the steady supply of plants. A secondary benefit of the project will be increased effectiveness of control efforts in downstream waters, where the CDBW is attempting to develop a low maintenance control program.

Ecological: Stressors Addressed

- **Undesirable species interactions; competition from introduced plants:** Ecologically essential native plants, upon which many organisms depend, are prevented from germinating by the hyacinth which blocks almost all light and out competes native plants. The project directly addresses this stressor by removing invasive, non-native, water hyacinth from the Stone Lakes Basin.

- **Water quality; low dissolved oxygen conditions:** One acre of hyacinth can deposit approximately 500 tons of rotting plant material each year, burying benthic organisms and decreasing the water's oxygen supply (Raynes 1964). Large-scale fish kills have resulted from complete depletion of oxygen under hyacinth mats (Timmer and Weldon 1967; Sharma et al. 1978). Following the removal of hyacinth, oxygen levels will increase substantially over pretreatment levels.

- **Channel form changes; channel aggradation due to fine sediments:** Siltation rates within the Stone Lakes Basin's shallow sloughs and channels will decrease after the dense, continuously decaying and sediment trapping hyacinth mats are removed.

- **Long-term reduction of stressors:** Long-term reduction of the stressors will be accomplished when recreational water users and others no longer transport hyacinth plants into the region. Our educational program informs local residents of the serious ecological, recreational and economic consequences of hyacinth proliferation, thus encouraging them to report occurrences, and reducing the likelihood that residents will purposely or unintentionally place hyacinth into waterways.

Ecological: Species of Concern

Fish are adversely affected by increasing hyacinth density which causes a decline in critical and significant food sources, zooplankton and phytoplankton (Gopal et al. 1984; Scott et al. 1979). In shallow water, where tidal action sweeps hyacinth roots across the substrate, benthic communities are disturbed as turbidity is increased. Typical Delta fish, both native and non-native, are present within the Stone Lakes Basin, along with large populations of migratory and resident birds. In addition to increased oxygen levels, the program will result in a long-term increase in benthic and planktonic invertebrates, encouraging the return and expansion of many fish populations. The return of beneficial aquatic plants, including native species, will enhance food and shelter for fish and waterfowl. Downstream fish species and waterfowl, will benefit indirectly by the reduction of migrating hyacinth.

- **Sacramento splittail:** *Pogonichthys macrolepidotus*, a native minnow, is probably present within the Stone Lakes Basin, as these fish prefer slow-moving water and dead-end sloughs in areas which are subject to flooding (Stone Lakes National Wildlife Refuge EIS 1991). The adult of this species prefers large stretches of open water. However, in the waters of the Stone Lakes Basin, hyacinth covers many of these ideal stretches, and displaces the emergent vegetation that the splittail requires for spawning. Hyacinth control will allow for an increase in total habitat area for the splittail.

- **Striped bass:** *Morone saxatilis*, a sought-after sport fish, requires open water in which to feed and broadcast-spawn their floating eggs. The USFWS has identified Stone Lakes Basin as potential rearing habitat for striped bass (SLNWR EIS 1991). By reducing floating aquatic vegetation, the hyacinth control program will improve habitat conditions for striped bass within the basin.

- **Migratory birds:** Few birds are capable of utilizing hyacinth-invaded habitat. It is nearly impossible to swim through, and provides only low-quality foraging habitat. Hyacinth removal will open water surface for foraging waterfowl. Forage fish, including threadfin shad and Mississippi silverside, have been observed in North Stone Lake. Populations of these important prey species will be enhanced with hyacinth removal, further increasing the aquatic food base.

Ecological: Habitats of Concern

- **Instream aquatic and shaded riverine aquatic:** The hyacinth now occupying the Stone Lakes Basin, if left unchecked could potentially expand from 30 acres to 240 acres in 30 to 45 days

(Wolverton and McDonald 1978; Penfound and Earle 1948). Living and dead roots within the water column create a continuous vertical net which traps fine sediment. This sediment, along with a constant supply of decaying organic material, accumulates under mats, creating islands, and increasing siltation rates (Mitsch 1977). Lakes, sloughs, and small channels eventually fill in and disappear. However, the eradication program is preventing, and will continue to prevent the expansion of this fast-growing plant, decreasing siltation rates, slowing aggradation, and preventing the loss of these valuable habitats.

- Tidal perennial aquatic habitat: In the downstream reaches, this habitat, in addition to those listed above, will benefit from hyacinth removal, as dispersal from the Basin is reduced.

Social:

- Recreation: Boat access is impeded and engines are damaged in areas where hyacinth mats have blocked channels or launch ramps. The potential for recreational fishing is decreased due to the reduced fish populations; and fishing access is lost when dense mats cover the water surface. Boating and fishing potential within the Stone Lakes Basin will increase substantially with a reduction in hyacinth cover.

- Human health: Hyacinth provides ideal habitat for mosquitos, a vector of human diseases (Sucharit et al. 1981). Mosquito populations will be reduced when this highly preferred habitat is eradicated.

- Public outreach and aesthetics: The Stone Lakes Basin is an integral part of our natural history, and provides excellent birding and nature walk opportunities. Many local residents attend weekend refuge tours sponsored by the USFWS. An annual public event, "Walk on the Wildside," is sponsored by representatives of SRCSD, USFWS, Caltrans, National Audubon Society, County Parks and Recreation Department and others, and includes tours and displays from many other organizations. This high profile event and other refuge tours attract thousands annually. Attendance is expected to grow each year. During annual and regular weekend tours, the SLWHCG will demonstrate the benefits of hyacinth control, and promote awareness of the damage this invasive plant may cause.

Economical:

- Reduced damage to agricultural equipment, irrigation structures, and channels: Hyacinth can damage pumps, and reduce flow through irrigation canals by 40% to 95% (Bogart 1949; Guscio et al. 1965). Agencies and farmers have reported economic losses due to increased labor costs (for hyacinth removal) and repair costs. Once hyacinth is removed, those within the Basin, as well as downstream, will benefit from a reduction in long-term costs, including the costs of large-scale channel dredging and pump repair.

- Increased water supplies: The high evapo-transpiration rate of hyacinth, plus its large storage capacity, accounts for a loss of up to 38.68 acre-inches of water per month over the normal evaporation rate of an acre of open water. This amount of water could irrigate an acre of corn for one year. Hyacinth removal will result in a reduction in evapotranspiration and sedimentation rates, and more water will be available to farmers as well as wildlife.

- Businesses: Marinas will benefit from reduced control costs and increased facility use.

- Flood protection: Economic losses have resulted from flooding which occurs when dense mats hinder water conveyance. An immediate benefit of hyacinth removal will be the prevention of such flooding.

Adaptive Management:

- Improved methods: Information gathered through the monitoring program will allow for the development of enhanced hyacinth removal methods. By adapting chemical application methods, the SLWHCG has already increased efficacy and reduced costs.

- CALFED Comprehensive Monitoring, Assessment and Research Program: Hyacinth may always exist within the waters of the Delta system; therefore, a standardized long-term eradication /monitoring policy is an essential component of the CALFED program. The results of this project will provide information which may be used to better manage other removal programs.

Education:

In Florida, a public awareness campaign against hyacinth transport has effectively reduced the expansion of the plant. In the Delta region, educational materials will encourage local residents to help achieve long-term control of hyacinth in the Stone Lakes Basin.

d. BACKGROUND AND BIOLOGICAL/TECHNICAL JUSTIFICATION

Background: Water hyacinth, a non-native plant, is often grown in landscaped ponds, only to be dumped in local waters when the plant overtakes its home. Boaters can accidentally transport the plant on trailers or in bilge pumps. Hyacinth reproduces at an astounding rate. In one growing season twenty-five plants can expand to cover 10,000 square meters of water surface (Barret 1989). Until control efforts began in 1996, hyacinth covered approximately 35% of the water surface in Stone Lakes Basin, and was rapidly expanding, causing harmful effects to wildlife and great economic loss to local farmers.

Progress, accomplishments, expenditures to date: Between the months of July and December, 1996, the SLWHCG reduced hyacinth cover by 85% (Appendix A). These short season results were accomplished at a cost of \$149,000 in labor, equipment, and chemical supplies. SRCSD activities accounted for \$62,438 of this total expenditure. In 1996, five large mats which covered approximately 50 acres of the north Southern Pacific Borrow Channel were treated with herbicide. The mats are now completely dissolved and plant density adjacent to the banks has been significantly decreased. It is now apparent that if the SRCSD portion of the program is funded, potential exists for complete hyacinth eradication in the Stone Lakes Basin.

Through monitoring and adaptive management techniques, the SLWHCG has developed a number of innovative and successful approaches for large-scale hyacinth control. For example, boom corraling, a technique which utilizes equipment fabricated by our staff, has dramatically decreased the time and effort involved in hand removal, and reduces the need for herbicidal chemicals. Through SRCSD field studies, and in collaboration with other members of the SLWHCG, we have improved herbicide application methods. In regard to timing of application and chemical choice, U.S. Department of Agriculture (1996) aquatic weed control investigations concluded with similar findings.

Alternative Methods: The SLWHCG considered several alternative methods of hyacinth eradication, including various biological control methods. For example, two species of weevils and a fungus forage exclusively upon hyacinth. However, these control agents do not reproduce as fast as hyacinth and can not significantly reduce coverage. While mechanical harvesters allow rapid removal of hyacinth, they can not reach plants along the shore, and cost up to 75 times more per acre than chemical control.

e. PROPOSED SCOPE OF WORK

Control Operations:

- **Chemical:** From March 1 to November 30 of each year, chemical control efforts occur on all suitable spray days, with herbicide being applied from boat-mounted spray rigs or terrestrial sprayers. Suitable spray days have winds less than 10 mph, no detectable inversion layer, and no rain in 12 hours. A two-person crew, consisting of a driver and a sprayer, operates a jon boat which has been modified to convey a 30-gallon spray rig. Crews use terrestrial sprayers where in-channel access is restricted by dense hyacinth growth, channel conditions (i.e., too shallow or narrow), or the lack of a boat launching site.

Chemicals are mixed, loaded, and applied in accordance with product labels and pesticide safety regulations described by the California Department of Pesticide Regulation. Rodeo® herbicide is used most frequently due to its relatively benign nature and low residual effect in water, and is most efficient early in the growing season and on seedlings and plants just out of dormancy. Reward® is used on late stage and late season plants which tend to be resistant to Rodeo®. However, Rodeo® is used again at the end of the season when plants actively translocate nutrients to the roots.

Depending on accessibility and density of infestations, the crew sprays 1/8 to 4 acres of hyacinth per eight hour shift. Approximately three weeks after treatment, the crew returns and treats plants again. Spraying is repeated until the eradication of all plants within a section has occurred. Crews monitor each section for dead/dying plants, new recruitment, and movement of plants due to wind, currents, etc. (see **Monitoring and Evaluation** below for methods). Information obtained from work crew daily reports will be summarized and reported quarterly. The information presented in this quarterly report will include a discussion relating the status and changes in water hyacinth cover, hours and equipment used during the period, and operation planning for the next period. The information

obtained through our pre- and post-season sampling will be summarized in research paper format and will include thorough methods, results and discussion sections. This report will be produced annually. All reports will be supplied to the funding agency, as well as the SLWHCG for review and comments. Monitoring results will be presented to CALFED four times per year, on February 28, May 31, September 30, and December 31 of each year.

It is imperative that hyacinth be dislodged from non-target vegetation and agricultural irrigation systems. However, control staff take specific precautions, utilizing alternative eradication methods around these features. Herbicidal spraying halts 20 meters short of any non-resilient or special-status plant species, and, when using Reward®, 100 meters short of any irrigation intake valves.

- Hand removal: When possible, or where immediate results are required (i.e., a pump is in danger of being damaged), the crews remove hyacinth by hand, using long-handled pull forks. After the plants dry out on the bank, landowners dispose of them.

- Boom method: Once hyacinth has been removed from a section, adjacent mats separate and disperse into the cleared areas. The clumps are difficult to treat and require more herbicide than the large continuous mats. In an attempt to increase efficiency while minimizing use of expensive herbicides, the crews utilize a booming method. When floating booms are strategically placed, the migration of plants is prevented, allowing sprayers to apply herbicide to captured plants. Plants are also corralled into a single point along the shore, then removed by hand. Booming and hand removal have the advantage of occurring during the hyacinth dormancy seasons when chemicals are ineffective.

- Aerial application: If the hyacinth mats are very large, appropriately situated, and when weather conditions are favorable, the most efficient method of eradication is through chemical application from a crop-duster plane. If necessary, the SRCSD will contract for aerial application.

f. MONITORING AND EVALUATION

Daily:

Daily reporting will be modeled after sampling protocol developed by the CDBW. Each work crew will perform a daily survey within a prescribed area, and semi-quantitatively estimate water hyacinth present based on a ranking scale (modeled after Summary of Operations, Water Hyacinth Control Program, CDBW 1987). See Table 1.

The crews will also record plant condition (i.e., healthy, dying, dead) and flowering phenology (% flowering), and suggest appropriate equipment for the treatment of the area, (i.e., Jon boat, terrestrial, hand removal, etc.). Treatment schedules will be based on the crew's evaluations. These daily reports will also serve to evaluate the response of hyacinth to treatment. An area which exhibits diminishing ranks will be indicative of a successful control method. However, an area where rank increase will demonstrate that a method was insufficient. The amount of time and the expense necessary to reduce an area to a lower ranking (i.e., problem area rank 5 reduced to rank 1) will be derived from the results. This information will be shared with other agencies to compare efficiency and estimate long-term control costs.

Periodic:

An intensive quantitative sampling program will take place at the beginning and end of each treatment season. This program will yield precise comparative data to be used in a statistical analysis of hyacinth population trends over time. In 1996, the year SRCSD hyacinth control efforts began in the Basin, water hyacinth covered up to 100% of the water surface in many areas. After the substantial 1996 control success, hyacinth reduction estimates were easily facilitated through visual observations or aerial photography. Presently, with hyacinth in narrow bands along the shorelines, and as the remaining plant cover approaches zero, we require greater sampling precision to detect minor changes. Detection of these minor changes is critical to determine whether the plant is actually being eradicated or merely being maintained in its present condition. Cover (here, percent plant cover per water surface area), one of the most common measurements in vegetation sampling, may be determined by various means (Bonham 1989). Modified point sampling, as used by the Florida Department of Natural Resources (Bartodzieg and Leslie 1991), and other less intensive methods were rejected for their inability to detect minor changes. Cover will be estimated at two levels.

- 1) Precise estimate of hyacinth present in the critical near-shore band: The precision and accuracy of this estimate will allow for the statistical detection of the minor changes expected as plant

cover nears zero (eradication). SRCSD research staff will use quadrat sampling as described by Bormann (1953) to estimate plant cover within the near-shore band. Crews will establish large 15'x100' quadrats, randomly located along the shoreline, and measure the width, perpendicular from the bank to the edge of the hyacinth mat at 5' intervals along one length of the quadrat (Fig. 1). We will calculate hyacinth area within each quadrat using Simpson's rule. Average cover for all quadrats will be statistically compared between seasons using the Student's t-test.

2) Total area of hyacinth cover present in the project area: The SRCSD will monitor total cover in Basin waters to predict control costs, and share the data with other agencies. Research staff will use a line-intercept method, modified from Tansley and Chip (1926), to estimate the total cover of hyacinth present within the total project site. Each transect will extend perpendicular from the shoreline for a distance equal to one half the distance to the opposite shoreline (Fig. 2). Distances will be calculated beforehand using aerial photos and/or GPS coordinates.

Qualified staff will report findings using accepted research paper format including thorough methods, results and discussion sections. This information will be submitted to CALFED and SLWHCG members for their review and comments.

Once hyacinth has been eradicated from the Basin, the SRCSD staff and USFWS staff will periodically search for plants by boat (as arranged with Tom Harvey, SLNWR manager). This preventative measure will ensure quick response to any re-infestations from an outside source.

Financial reports: SRCSD program expenditures will be tracked by the Sacramento County Accounting and Recording System, and results will be compiled in a quarterly report to CALFED. Reports will include monthly SRCSD expense summaries and "expenditures to date" information, with the year-end quarterly report also containing the total expense outlay from other agencies of the SLWHCG.

Biomonitoring: While hyacinth control evaluation is the primary focus of the monitoring program, long-term and short-term biotic effects will also be monitored. Qualified research staff will collect water samples from treatment areas and have them analyzed for herbicide residues. Invertebrate populations, which are expected to eventually increase in abundance after hyacinth removal, will be monitored before and after chemical application. The objectives of the biomonitoring program include 1) determining the rate at which herbicidal chemicals applied to hyacinth become undetectable, 2) determining whether a short-term impact on invertebrates (e.g., reduction) occurs post-treatment, and 3) determining whether a long-term effect on invertebrates (e.g. overall increase) occurs with time, after hyacinth removal. Appendix B contains biomonitoring methods. Results of the biomonitoring program will be analyzed by SRCSD staff, placed into scientific report form and submitted to CALFED and the SLWHCG.

g. IMPLEMENTABILITY

The SLWHCG has obtained all permits, and complied with all applicable laws and regulations. The project is permitted by the Sacramento County Water Agency (SCWA), which has jurisdiction over all waterways within the county. SRCSD staff uses herbicides through a "permit to apply pesticide" held by the SCWA (operator I.D. No.349-734-00072), obtained through the County Agricultural Commission (CAC). SRCSD staff reports chemical use rates to the SCWA which in turn reports to the CAC. The State of California Department of Pesticide Regulation requires that any applicator of a pesticide either holds, or is supervised by someone who holds, a Qualified Applicator Certificate. Bryan Young, crew supervisor, holds a Pesticide Applicator Certificate (No. QC14783) which includes pest control category, "aquatic." SRCSD staff complies with federal laws by following all chemical labeling precedures for storing, mixing, loading, applying, and disposal.

The project complies with, and supports ecosystem enhancement goals set forth in the NEPA document, Stone Lakes National Wildlife Refuge EIS, 1991.

Local support for project activities is widespread, with land owners, agencies, and local businesses working cooperatively. Letters of support are included in Appendix C. The education program will be facilitated by local merchants. Managers of many boat shops, marinas, and aquatic plant nurseries have volunteered to post publications in their places of business (Appendix D).

FIGURE 2

LINE INTERCEPT TRANSECT DIAGRAM

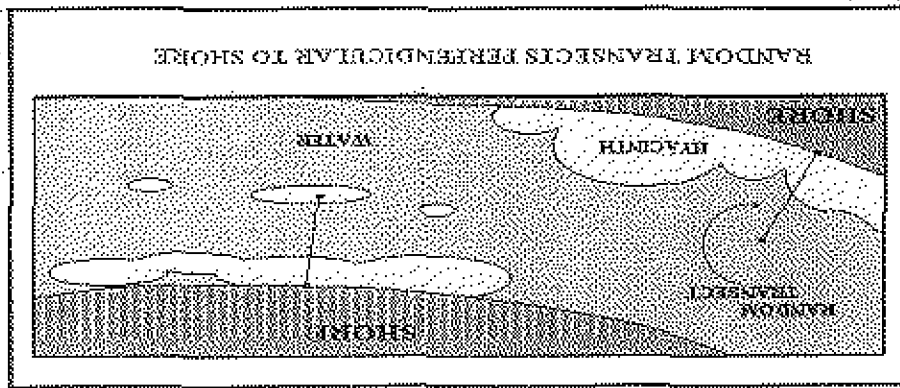


FIGURE 1

Quadrat Sampling Diagram

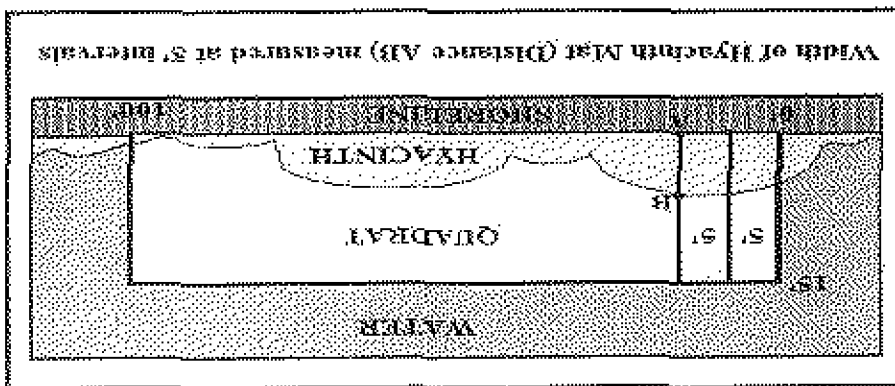
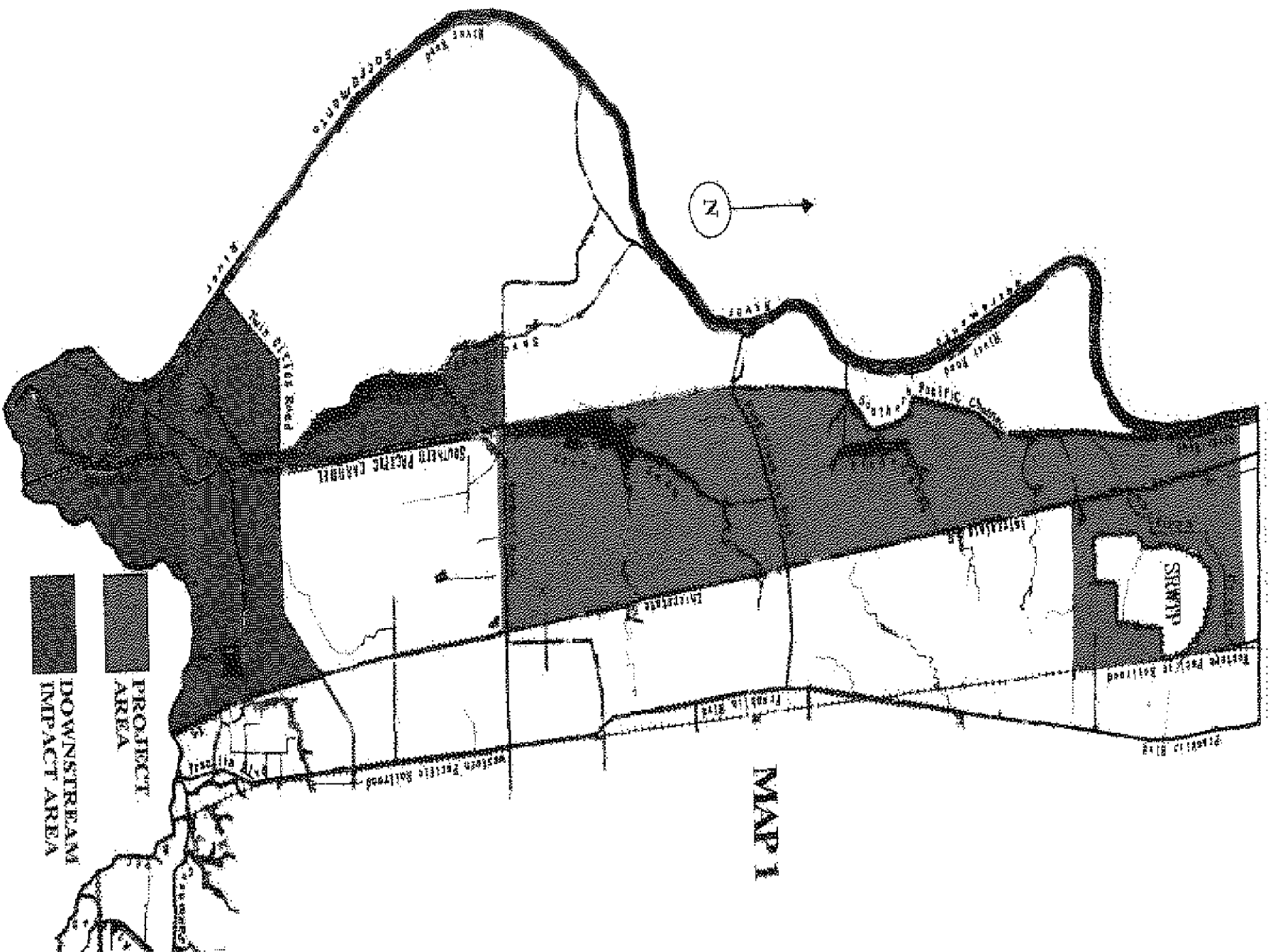


TABLE 1

RANKING CRITERIA FOR DAILY MONITORING

RANK	DESCRIPTION
1	Observers must search, hunt and peck, to locate waterhyacinth
2	Observers can easily spot waterhyacinth plants floating as singles or dinner plate sized groups
3	Plants are found in small, noncontinuous mats, 20-30 ft. long and no greater than 30 ft. wide
4	Plants are found in large, continuous mats greater than 30 ft. wide
5	Plants are found in large, continuous mats greater than 30 ft. wide and are causing or will soon cause problems and need immediate attention



IV. Costs and Schedule to Implement Proposed Project

a. BUDGET COSTS

CALFED Funding Request: Over the next three years, an estimated \$675K will be needed to eradicate water hyacinth from the Stone Lakes Basin. The Sacramento Regional County Sanitation District (SRCSD) is requesting a total of \$433,620 from CALFED to fund a substantial portion of this eradication program. The balance of the funding will be provided through equipment, material, and labor contributions from other members of the Stone Lakes Water Hyacinth Control Group (SLWHCG). Tables 2 - 4 specify the breakdown of costs for each project phase and task for which CALFED funding is requested.

Basis/Need for CALFED Funding: Water hyacinth control efforts in the Stone Lakes Basin began in 1995. Early efforts at controlling this noxious weed were sporadic and did not result in an actual reduction of hyacinth within the Basin. The first reduction of water hyacinth in the Stone Lakes Basin was realized only after July, 1996, when the Sacramento County Board of Supervisors authorized an emergency expenditure of \$100K to be used for water hyacinth control. This funding was administered through the SRCSD, the lead agency for the SLWHCG through 1996. Through cooperation among all parties of the SLWHCG, the amount of water hyacinth in the Basin was reduced by approximately 85% in five months of treatment. Encouraged by the 1996 results and fearing that conditions would regress to pre-1996 levels, the Board authorized a final emergency expenditure of \$25K. This funding is intended to keep the hyacinth control program operating at its present level through 1997.

If CALFED does not grant the funds we are seeking, SRCSD will continue to support the SLWHCG but may pass the lead agency role to one of the other participants. Without funding, SRCSD will support the SLWHCG primarily as a technical advisor, but will also continue to keep their property borders free of hyacinth and allow the use of their specialized equipment by any other participant with a larger operating budget.

Even in the absence of CALFED funding, the participants of the SLWHCG will likely continue their hyacinth control efforts. Yet, with SRCSD funds representing nearly half of the total funds expended on the control program to date, loss of this principal funding source will likely result in the inability of SLWHCG to meet their goal of water hyacinth eradication. In fact, unless a new source of funding can be identified, the SLWHCG will have difficulty even keeping water hyacinth growth in check. Due to hyacinth's phenomenal growth rate and proclivity to invade new areas, the inability to keep hyacinth growth in check for one season will make it exponentially more difficult to control in subsequent years and could potentially nullify all previous efforts expended to date. Loss of hyacinth control in the Stone Lakes Basin will have serious social, ecological, and economical impacts not only to the Basin itself, but the sensitive downstream habitats as well (see section III c).

Potential for Incremental CALFED Funding for Distinct Project Phases: Phases for the water hyacinth control program have been defined at one year intervals. Phase one will begin Feb. 1, 1998 and end Jan. 31, 1999, followed by phase two in 1999/2000, and phase three in 2000/01 (Table 5). Each phase can be funded separately. If water hyacinth has not been eradicated by Dec. 31, 2000, a second proposal for additional funding will be submitted.

Contingency Planning: If CALFED funds for the continuance of the water hyacinth eradication program are not granted, the SLWHCG is likely to continue the effort, operating at a diminished capacity. SRCSD will continue to support the SLWHCG, but without funding, will serve primarily as a technical advisor.

By taking advantage of the substantial suppression achieved in the previous two years, it may be possible to sustain hyacinth control for a short period while alternative funding is sought. Funding

alternatives may come via further grant proposals requested by other SLWHCG participants to CALFED or other agencies, or larger water hyacinth control budget allocations by one or all participants of the SLWHCG.

Funding Partnership Needs and Commitments: During the 1996 hyacinth control season, contributions of labor, equipment, and materials from SLWHCG members other than SRCSD, totaled approximately \$82.5K (Sacramento Regional County Sanitation District 1996). Attached letters of support from the participants of SLWHCG indicate that they are willing to continue to support the control effort at past levels, if SRCSD receives the funding to serve as the lead agency. Therefore, based on figures assembled after the 1996 control season, the SLWHCG can be expected to provide approximately \$245K, in time and materials, over the next three years of the hyacinth control program.

Subcontract Bid and Evaluation Process: Implementation of this project requires purchasing goods and services from private vendors. No single purchase shall exceed \$5000. Items totaling \$3,000 to \$5,000 will require a minimum of three competitive bids including one from a minority or woman owned business (M/WBE). Items totaling \$1,000 to \$2,999 will require a minimum of two bids including one from a M/WBE. Items totaling \$301 to \$999 require at least one bid from a M/WBE. All bids will be evaluated by deducting 5% from the M/WBE bid, and selecting the lowest bid.

b. SCHEDULE MILESTONES

Start / Completion Dates of Specific Tasks (see Table 5)

Payments vs. Milestones Payment for the first year of the program will be needed by Feb. 1, 1998. Payments for year two and three will also be needed prior to the start of each year's water hyacinth monitoring programs, scheduled for Feb. 1, 1999 and Feb. 1, 2000 respectively. Payments for the second year of operations may be adjusted depending on results from the first year's water hyacinth monitoring report, a key milestone of this project. Payments for the third year of operations may also be adjusted depending on water hyacinth monitoring results reported for year two.

c. THIRD PARTY IMPACTS

Impact: Most lands adjacent to the open water habitat of the Stone Lakes Basin are agricultural. Crops such as tomatoes, corn, and grapes are often produced near areas of water hyacinth receiving chemical treatment. Drift from these chemical sprays are potentially damaging to adjacent crops. Many of these crops are also irrigated with the water from treatment areas. Certain chemicals used in the treatment of water hyacinth can damage crops if applied directly to irrigation water.

Mitigation: All chemicals shall be applied only as directed by the label and by local restrictions set by the county agricultural commissioner. Furthermore, to avoid drift, no chemical shall be applied when an inversion layer is present or if winds exceed 10 mph. If winds are in excess of 5 mph, drift control agents will be used and spray pressure will be decreased. Irrigation water contamination will be avoided by maintaining sufficient buffer zones around all water diversions. Here, hyacinth shall be either hand removed or treated with a chemical labeled for use in irrigation water.

TABLE 2.
Breakdown of Cost Estimates for
Proposed CALED Funded Tasks in Phase 1*

Project Phase and Task	Direct Labor Hours	Direct Salary and Benefits	Overhead Labor	Service Contracts	Materials	Miscellaneous and other Direct Costs	Total Task Cost
Growing season operations and maintenance phase 1	3,310	\$58,120	\$14,530	\$2,500	\$10,000	\$9,000	\$94,150
Dormant season operations and maintenance phase 1	620	\$11,710	\$2,930	\$0	\$400	\$500	\$15,540
Invertebrate sampling, analysis, and reporting phase 1	20	\$560	\$140	\$8,100	\$0	\$100	\$8,900
Water quality sampling, analysis, and reporting phase 1	60	\$1,060	\$270	\$11,760	\$0	\$100	\$13,190
Water hyacinth eradication progress monitoring and reporting phase 1	495	\$8,370	\$2,090	\$0	\$500	\$100	\$11,060
Water hyacinth community outreach / education program phase 1	180	\$3,060	\$760	\$2,000	\$200	\$100	\$6,120
						PHASE 1 TOTAL	\$148,960

* - Phase 1 corresponds to all work to be completed between Feb. 1, 1998 and Jan. 31, 1999.

Direct Labor Hours - total number of person hours projected to accomplish the designated task and phase.

Direct Salary and Benefits - total amount of funding needed to compensate (in salary and benefits) direct labor hours necessary to accomplish the designated task and phase.

Overhead Labor - indirect overhead costs: payroll, insurance costs, processing, and general administration.

Service Contracts - funding needed to contract with outside entities to accomplish tasks that cannot be completed in-house. May include contracted aerial spraying, aerial photography, or mechanical harvesting.

Materials - funding needed to cover predictable material costs such as herbicides, spreader/stickers, drift control agents, fuel, and booming materials.

Miscellaneous and other Direct Costs - funding needed to cover miscellaneous costs: equipment maintenance and repair.

TABLE 3.
Breakdown of Cost Estimates for
Proposed CALED Funded Tasks in Phase 2*

Project Phase and Task	Direct Labor Hours	Direct Salary and Benefits	Overhead Labor	Service Contracts	Materials	Miscellaneous and other Direct Costs	Total TaskCost
Growing season operations and maintenance phase 2	3,310	\$58,120	\$14,530	\$2,500	\$8,500	\$9,000	\$92,650
Dormant season operations and maintenance phase 2	620	\$11,710	\$2,930	\$0	\$400	\$500	\$15,540
Invertebrate sampling, analysis, and reporting phase 2	20	\$560	\$140	\$8,100	\$0	\$100	\$8,900
Water quality sampling, analysis, and reporting phase 2	60	\$1,060	\$270	\$11,760	\$0	\$100	\$13,190
Water hyacinth eradication progress monitoring and reporting phase 2	495	\$8,370	\$2,090	\$0	\$500	\$100	\$11,060
Water hyacinth community outreach / education program phase 2	50	\$910	\$230	\$500	\$0	\$100	\$1,740
						PHASE 2 TOTAL	\$143,080

* - Phase 2 corresponds to all work to be completed between Feb. 1, 1999 and Jan. 31, 2000.

Direct Labor Hours - total number of person hours projected to accomplish the designated task and phase.

Direct Salary and Benefits - funding that will be needed to compensate (in salary and benefits) the total of direct labor hours necessary to accomplish the designated task and phase.

Overhead Labor - indirect overhead costs such as payroll, insurance costs, and general administration.

Service Contracts - funding needed to contract with outside entities to accomplish tasks that cannot be completed in-house. May include contracted aerial spraying, aerial photography, or mechanical harvesting.

Materials - predictable material costs: herbicides, spreader/stickers, drift control agents, fuel, and booming materials.

Miscellaneous and other Direct Costs - funding needed to cover miscellaneous costs: equipment maintenance and repair.

TABLE 4.
Breakdown of Cost Estimates for
Proposed CALED Funded Tasks in Phase 3*

Project Phase and Task	Direct Labor Hours	Direct Salary and Benefits	Overhead Labor	Service Contracts	Materials	Miscellaneous and other Direct Costs	Total Task Cost
Growing season operations and maintenance phase 3	3,310	\$58,120	\$14,530	\$2,500	\$7,000	\$9,000	\$91,150
Dormant season operations and maintenance phase 3	620	\$11,710	\$2,930	\$0	\$400	\$500	\$15,540
Invertebrate sampling, analysis, and reporting phase 3	20	\$560	\$140	\$8,100	\$0	\$100	\$8,900
Water quality sampling, analysis, and reporting phase 3	60	\$1,060	\$270	\$11,760	\$0	\$100	\$13,190
Water hyacinth eradication progress monitoring and reporting phase 3	495	\$8,370	\$2,090	\$0	\$500	\$100	\$11,060
Water hyacinth community outreach / education program phase 3	50	\$910	\$230	\$500	\$0	\$100	\$1,740
						PHASE 3 TOTAL	\$141,580

* - Phase 3 corresponds to all work to be completed between Feb. 1, 2000 and Jan. 31, 2001.

Direct Labor Hours - total number of person hours projected to accomplish the designated task and phase.

Direct Salary and Benefits - funding needed to compensate (in salary and benefits) the total of direct labor hours necessary to accomplish the designated task and phase.

Overhead Labor - indirect overhead costs such as payroll, insurance costs, and general administration.

Service Contracts - funding needed to contract with outside entities to accomplish tasks that cannot be completed in-house. May include contracted aerial spraying, aerial photography, or mechanical harvesting.

Materials - predictable material costs: herbicides, spreader/stickers, drift control agents, fuel, and booming materials.

Miscellaneous and other Direct Costs - funding needed to cover miscellaneous costs: equipment maintenance and repair.

TABLE 5.
Start / Completion of Specific Tasks

Task	Phase 1 Start / Completion	Phase 2 Start / Completion	Phase 3 Start / Completion
Growing Season Operations and Maintenance	Mar. 1, 1998 / Nov. 30, 1998	Mar. 1, 1999 / Nov. 30, 1999	Mar. 1, 2000 / Nov. 30, 2000
Dormant Season Operations and Maintenance	Dec. 1, 1998 / Feb. 28, 1999	Dec. 1, 1999 / Feb. 28, 2000	Dec. 1, 2000 / Jan. 30, 2001
Invertebrate Sampling	Jun. 1, 1998 / Nov. 30, 1998	Jun. 1, 1999 / Nov. 30, 1999	Jun. 1, 2000 / Nov. 30, 2000
Water Quality Sampling	Jun. 1, 1998 / Nov. 30, 1998	Jun. 1, 1999 / Nov. 30, 1999	Jun. 1, 2000 / Nov. 30, 2000
Water Hyacinth Monitoring	Feb. 1, 1998 / Dec. 31, 1998	Feb. 1, 1999 / Dec. 31, 1999	Feb. 1, 2000 / Dec. 31, 2000
Community Outreach	Feb. 1, 1998 / Dec. 31, 1998	Feb. 1, 1999 / Dec. 31, 1999	Feb. 1, 2000 / Dec. 31, 2000

V. Applicant Qualifications

The core actions of this project will be performed by Sacramento County employed Maintenance Helpers and Park Maintenance Workers under the supervision of a Sacramento County employed Natural Resource Specialist. Two Maintenance Helpers or Park Maintenance Workers will be assigned to the hyacinth program each work day between the March 1 and Nov. 31. Their duties will include chemical application on water hyacinth, hand removal of water hyacinth, and program monitoring. Additional hand removal, monitoring work, as well as community outreach work will be performed outside of the above mentioned dates. All assigned county workers will be trained in the safe and effective handling of herbicides, recognition of sensitive plant species, and in vegetation monitoring techniques. The County Natural Resource Specialist will be responsible for filing all pesticide reports, monitoring reports, and expense reports. The Natural Resource Specialist will also be responsible for coordinating the efforts of other agencies and private parties who have agreed to contribute to this cooperative effort.

Collaborating Parties:

Private Landowners - Will continue to control hyacinth within their property borders through chemical applications and mechanical removal. Chemical applications will be coordinated through the County Natural Resource Specialist.

Beach Lake Ski Club - Will continue to control hyacinth within their recreational use areas. They will control hyacinth through chemical applications and mechanical removal. Chemical applications will be coordinated through the County Natural Resource Specialist.

U.S. Fish and Wildlife Service (USFWS) - Along with California Department of Boating and Waterways (CDBW), USFWS will continue to serve as a primary consultant to the County Natural Resource Specialist. Through regular steering meetings, this agency will assist in prioritizing areas of treatment, developing methods of treatment, and implementing a community outreach program. USFWS staff will also continue to control hyacinth chemically and mechanically and assist with the monitoring program. Tom Harvey, manager of the Stones Lake National Wildlife Refuge, is the principal USFWS participant in the water hyacinth program. A brief biosketch of Mr. Harvey is included in the following section.

California Department of Boating and Waterways - Along with USFWS, CDBW will continue to serve as a primary consultant to the County Natural Resource Specialist. Through regular steering meetings, this agency will assist in prioritizing areas of treatment, developing methods of treatment, and keeping program participants updated on technological advances made in hyacinth control elsewhere in the state, country, and world. This agency will also lend support of additional hyacinth spray crews or spray equipment, as needed, on an emergency basis. A brief biosketch of the CDBW Aquatic Pest Control Supervisor, Valerie VanWay, is included in the next section.

Sac-Yolo Mosquito and Vector Control District - Will continue to chemically treat hyacinth as directed by the County Natural Resource Specialist.

Cal Trans - Will continue to supply labor support for hand removal projects in areas designated by the County Natural Resource Specialist.

Florin Resource Conservation District - Will continue to serve as a liaison between private landowners and public agencies.

Biosketches of Key Participants

Bryan Young - Sacramento County Natural Resource Specialist

Education

B.S. Wildlife and Fisheries Biology, University of California, Davis

Licenses

State of California, Qualified Applicator Certificate

State of California, Agricultural Pest Control Advisor License

Hyacinth Experience

1996-Present Coordinates a multi-agency hyacinth control program on over 250 acres of open water habitat in the Stone Lakes Basin. 1996 effort resulted in an approximate 90% reduction of water hyacinth. Also, conducts or coordinates all necessary training, monitoring, and reporting.

1993 - 1994 Conducted a successful water hyacinth eradication campaign within a 45 acre mitigation wetland area on the Sacramento Regional Wastewater Treatment Plant (SRWTP) property.

Related Experience

1993-Present Devises and implements integrated pest management (IPM) programs targeting various exotic plant species on approximately 2,500 acres of SRWTP property. A large portion of this property is currently being developed as a wildlife area. Targeted weeds include yellow star thistle, perennial pepper weed, and Bermuda grass. Programs include mowing, burning, discing, and chemical applications for the establishment and maintenance of native grassland, riparian forest, and wetland restoration projects.

1993-Present Conduct vegetation monitoring programs to discern the success of native plant restoration projects and to evaluate IPM programs used in the establishment and maintenance of these projects. Performs quadrat sampling, step-point, and line-intercept vegetation sampling methods.

1992 - 1993 Devised and implemented integrated pest management (IPM) programs targeting common agricultural weeds for a commercial native grass seed farm (Hedgerow Farms). Programs included mowing, burning, discing, and chemical application.

References

Roy Nelson, SRWTP, Bufferlands Manager - (916)-362-7740

Dr. John Anderson, Hedgerow Farms Manager - (916)-662-4570

Tom Harvey - Stone Lakes National Wildlife Refuge Manager

Education

B.A. General Biology, California State University, San Francisco

M.A. Ecology, California State University, San Francisco

Licenses

State of California, Qualified Applicator Certificate

Hyacinth Experience

1996-Present Active participant for the USFWS water hyacinth control program on over 250 acres of open water habitat in the Stone Lakes Basin. Duties include direct hyacinth control through hand removal or chemical applications, all required pesticide use reporting, and assistance in the coordination of all collaborating parties of the SLWHCG. The 1996 effort resulted in an approximate 90% reduction of water hyacinth.

Related Experience

1982-Present Devises and implements integrated pest management (IPM) programs targeting

various exotic plant species, to enhance recovery efforts for endangered plants and wildlife on three National Wildlife Refuges. Programs included mechanical, cultural, and chemical methods to control such species as ice plant, dune grass, California grass, tamarisk, pampas grass, eucalyptus, yellow star thistle, and black locust.

1982-Present Coordinates wildlife and vegetation monitoring programs designed to assess population dynamics and population health. Programs are also used to evaluate progress towards refuge management goals of enhancing natural wetlands, restoring native plant communities, and enhancing the recovery of migratory water bird populations.

References

Scott Stenquist, Region 1 IPM Coordinator - (503)-231-6172

Valerie VanWay - California Boating and Waterways, Aquatic Pest Control Supervisor

Education

B.S. Zoology, University of California, Berkeley

Licenses

State of California, Qualified Applicator Certificate

State of California, Agricultural Pest Control Advisor License

State of California, Certified Crop Inspector

Hyacinth Experience

1995-Present Provides SLWHCG with expert council on hyacinth treatment and removal methods.

1995-Present Manages a staff of 8 - 16 CDBW workers, and is responsible for hyacinth control in the navigable Delta waterways and tributaries from Lake Natomas in Sacramento County to the Kings River in Fresno County. Operations include direct hyacinth control through mechanical removal or chemical applications, all required pesticide use reporting, and contracting with private entities for further support as necessary.

Related Experience

1990-Present Coordinates and conducts various *hydrilla* eradication projects for the U.S. Department of Food and Agriculture in southern California. Project sites include Lake Murray and Lake Mordigan.

1981-1985 Achieved complete eradication of avian pest species, *Zosterops palpebrosa*, in San Diego, California. Work performed in conjunction with the U.S. Department of Food and Agriculture.

1981 Worked with U.S. Department of Food and Agriculture to achieve successful eradication of the Mediterranean fruitfly from Los Gatos, California.

References

Don Walt, CDBW, Chief of Facilities - (916)-322-1801

Stanley Martinson, California State Water Board, Chief of Water Quality - (916)-657-0754

VI. Compliance with Sandard Terms and Conditions

The applicant /principal investigator, Bryan J. Young, as a representative of the Sacramento Regional County Sanitation District, is agreeable to and able to comply with all terms and conditions set forth in the 1997 Category III Request for Proposals. RFP Table D indicates that the applicant is required to submit item 8, Nondiscrimination Compliance Statement (attachment).

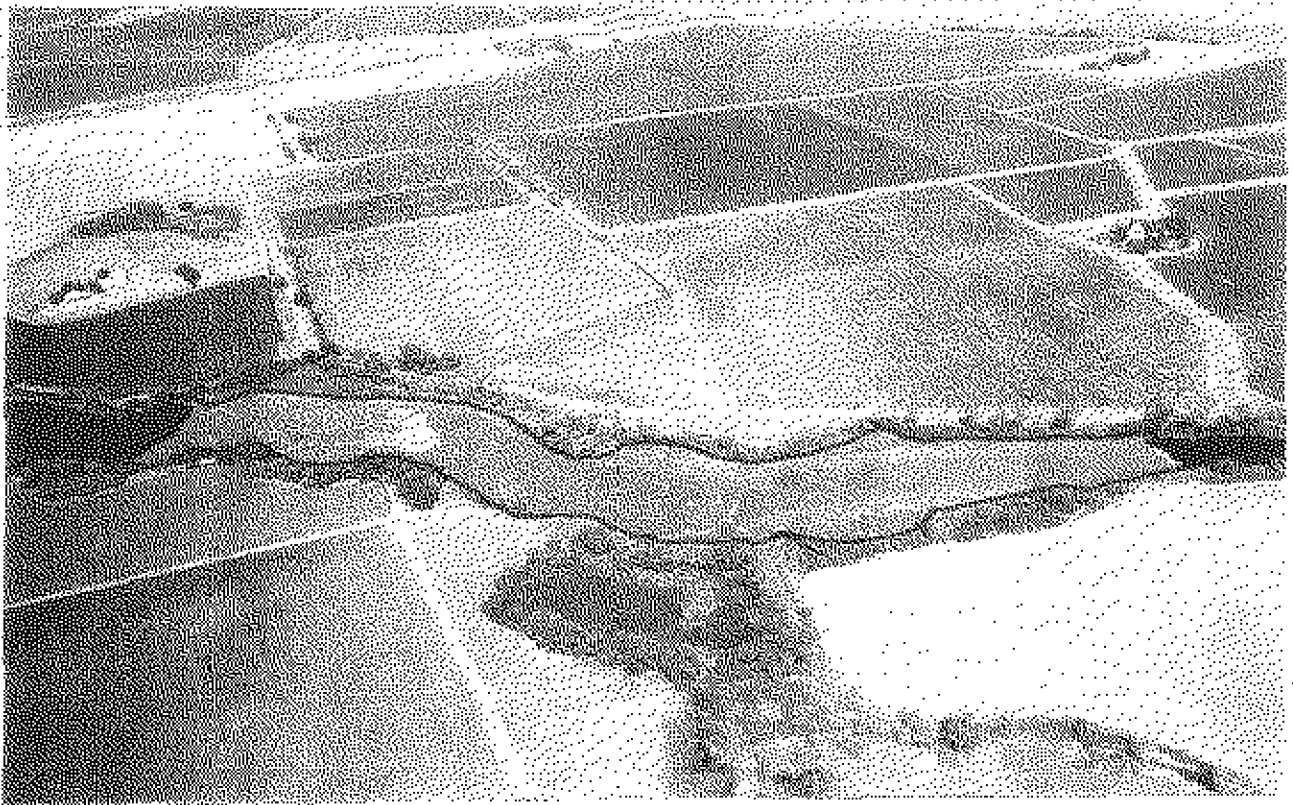
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Appendix A-

SLWHCG 1996 Control Program - Pre-treatment and Post-treatment Condition of Water Hyacinth in Three Locations within the Stone Lakes Basin (following three pages)

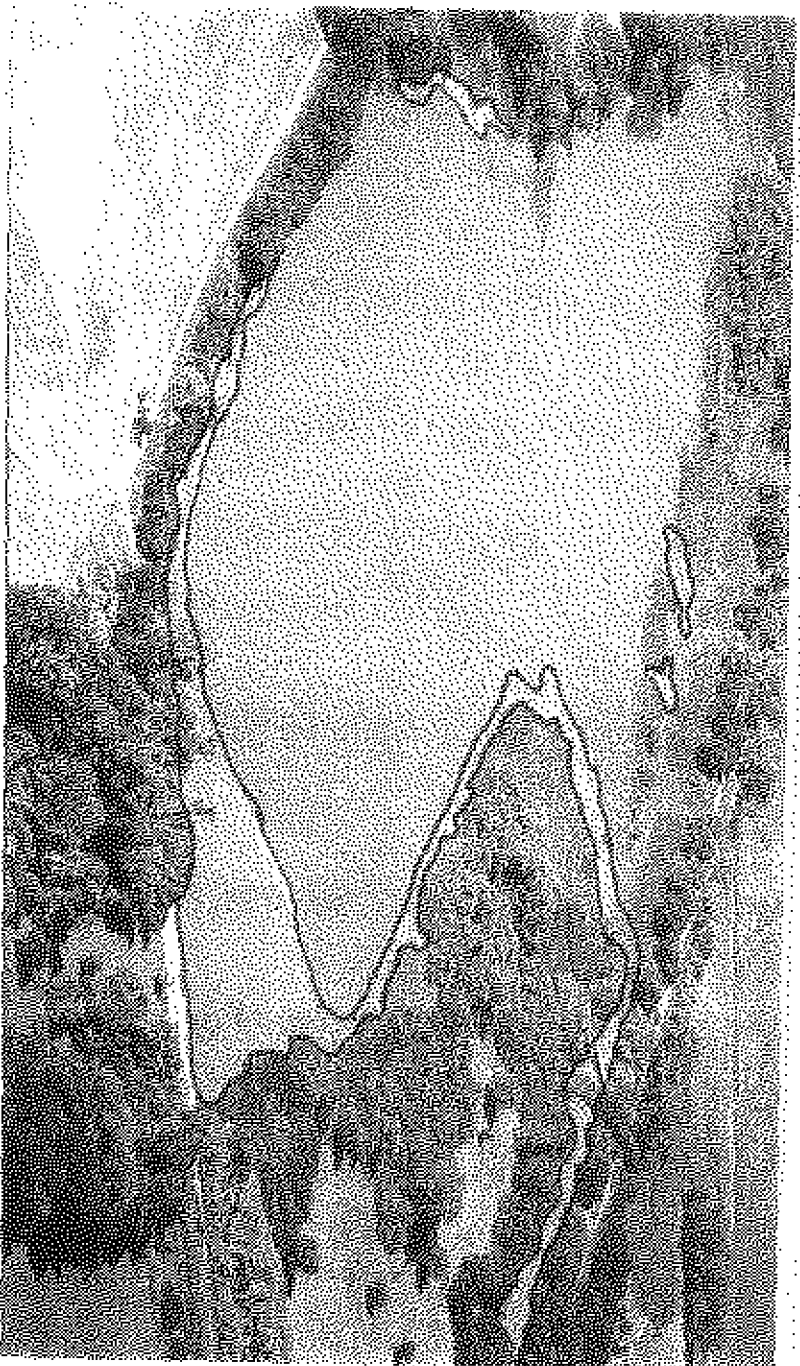
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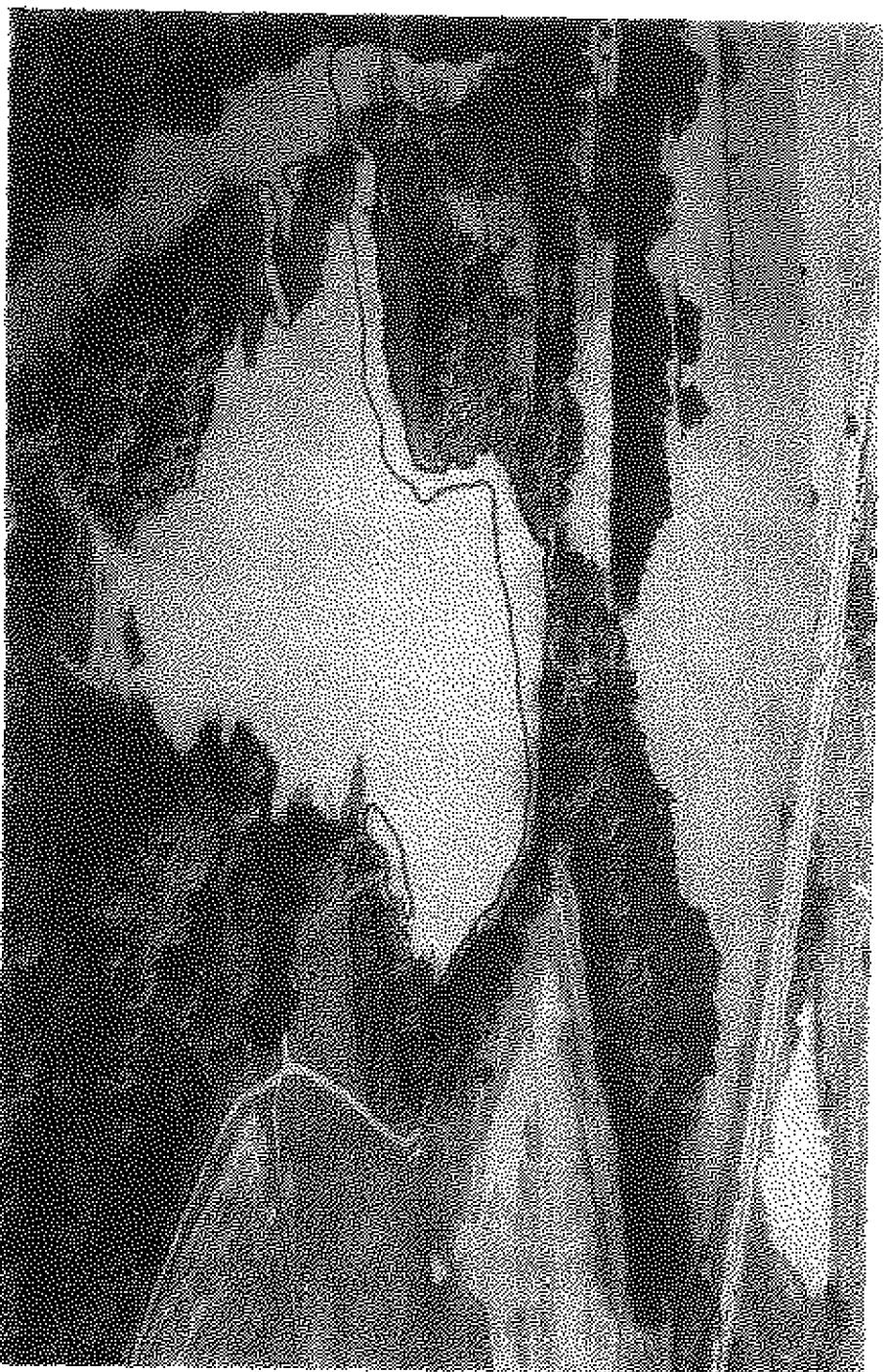
July 15, 1996



May 1, 1997



July 15, 1996



May 15, 1997

I-004109



July 15, 1996



May 1, 1997

Appendix B -

Biomonitoring program for 1998 - 2000 Water Hyacinth Control Program in the Stone Lakes Basin

The biomonitoring program is derived from a California Fish and Game protocol (1996) designed to assess the biological impact of aquatic herbicide application. The procedures include:

- a) chemical analyses of water for diquat dibromide (Reward®) and glyphosate (Rodeo®) residues; and
- b) population monitoring of benthic (bottom dwelling) and planktonic (free swimming) invertebrates.

Water will be tested for either diquat dibromide or glyphosate, depending on which chemical is used during the month to be sampled. Field sample collection, storage of samples and transport will be the responsibility of SRCSD research staff. However, water and invertebrate samples will be precessed by the BSK Analytical Laboratories and Fish and Game Water Pollution Control Lab, respectively. Invertebrates will be sampled and processed according to the California Lentic Bioassessment Procedures (California Department of Fish and Game 1996).

Sampling Stations: SRCSD research staff will select three sampling sites within the Stone Lakes Basin. Two sites will be within herbicide treatment areas. One site, which will not be treated, will serve as a control. At each site, researchers will establish a transect using the Global Position System (GPS). Two samples will be collected at each transect for a total of six sample locations.

Water Sample Collection Schedule: At each location, one set of samples will be collected for each month; June, July, August, September, October. One set consists of four samples:

- 1) one day prior to treatment
- 2) day of treatment (4-6 hrs)
- 3) two days post treatment
- 4) four days post treatment

3 transects x 2 sample sites each = 6 samples/day x 4 days/month = 24 samples/month
24 samples/month x 5 month of sampling per year = 120 samples/year
120 samples/year x 3 years = 360 total water samples

Invertebrate Sample Collection Schedule: At each location, one set of samples will be collected each month; June, August, and October. One set consists of three samples:

- 1) one day prior to treatment
- 2) eight days post treatment
- 3) sixteen days post treatment

3 transects x 2 samples sites each = 6 samples/day x 3 days/month = 18 samples/month
18 samples/month x three months/year = 54 samples/year
54 samples/year x 3 years = 162 total invertebrate samples

Appendix C -

Letters of Support and Pledges to Assist (following 10 pages)

From:

Thomas E. Harvey, Project Leader, Stone Lakes National Wildlife Refuge, U.S. Fish and Wildlife Service

John D. Webb, Chief, Office of Environmental Management, Department of Transportation

Frank E. Carl, Agricultural Commissioner, County of Sacramento

David Brown, Manager, Sacramento-Yolo Mosquito & Vector Control District

Galen Whitney, landowner and farm operator, Stone Lakes Basin

LaRue Shock, landowner and farm operator, Stone Lakes Basin

Carl P. Amundson, Director, Florin Resource Conservation District

Valerie VanWay, Aquatic Pest Control Supervisor, California Department of Boating and Waterways



IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Stone Lakes National Wildlife Refuge

2233 Watt Avenue, Suite 375

Sacramento, California 95825-0509

July 25, 1997

To whom it may concern:

On behalf of the U.S. Fish and Wildlife Service (Service), I wish to express our support for the ongoing water hyacinth control program in the Stone Lakes Basin and the efforts of the Sacramento Regional County Sanitation District (District) to secure additional funding for this project.

In addition to exacerbating flooding and impeding the conveyance of water for farming and habitat management in the basin, water hyacinth poses a significant threat to fish and wildlife populations and could eventually eliminate all open water habitat in the Stone Lakes Basin. As a result of these threats to natural resources, the Service's Stone Lakes National Wildlife Refuge (NWR) has actively participated in the cooperative hyacinth control program in the basin. With the support of private landowners, local and state agencies, and the Service, the District has successfully coordinated a program that has made substantial headway towards ultimately eradicating water hyacinth in the Stone Lakes area. Stone Lakes NWR staff intend to remain active partners in the control project while contributing both funding and in-kind assistance. For this successful campaign to continue, I believe it is most appropriate for the District to continue as lead agency responsible for coordinating the effort.

In conclusion, I urge you to consider providing additional financial assistance so that this worthwhile and cooperative program can continue. Please contact me (916/979-2085) if you require additional information.

Sincerely,

Thomas E. Harvey
Project Leader

DEPARTMENT OF TRANSPORTATION

DISTRICT 3, SACRAMENTO AREA OFFICE - MS 41
P.O. BOX 942874
SACRAMENTO, CA 94274-0001
TDD Telephone (916) 741-4509
FAX (916) 323-7869
Telephone (916) 324-5150



July 23, 1997

To Whom It May Concern:

The California Department of Transportation (Caltrans) supports the Sacramento Regional County Sanitation District (SRCSD) proposal for funding of the Stone Lakes Basin, Water Hyacinth Eradication Program. This program was started in 1996 and has achieved a high level of success in establishing an initial level of control on water hyacinth. However, without continued efforts, eradication of this noxious pest species would be impossible thereby resulting in significant environmental and economic damage to the waterways of the Stone Lakes basin.

The explosive reproductive capabilities of water hyacinth were demonstrated in 1995 with the first appearance of large numbers of hyacinth in the upper reaches of the Stone Lakes basin. During that year, the primary water source for Caltrans' Beach Lake Mitigation Bank (Lower Beach Lake) was rapidly covered by mats of the hyacinth. This resulted in severely impaired pumping abilities into the restored wetlands as well as overall reduction in use of the habitats at Beach Lake by various animals. The detrimental effects to habitat restoration efforts and to the existing wildlife values of the site amplified the need for control of this pest species.

The recognition that water hyacinth poses a severe threat to the ecological and economic health of the area has resulted in the establishment of a unique cooperative effort among various governmental agencies at Federal, State, and Local levels and private individuals. As a result of the 1996 and 1997 efforts, water hyacinth populations in the upper reaches of the waterways in the Stone Lakes basin have been substantially reduced. Continued control activities would result in further reduction and probable eradication of the hyacinth from this basin. The leadership provided by the SRCSD has been instrumental in the level of control achieved to date and Caltrans supports the continued leadership of the SRCSD in this effort.

Sincerely,

A handwritten signature in dark ink, appearing to read "John D. Webb".

JOHN D. WEBB, Chief
Office of Environmental Management, Sacramento



COUNTY OF SACRAMENTO

AGRICULTURAL COMMISSIONER WEIGHTS AND MEASURES

Frank E. Carl
Agricultural Commissioner
Director of Weights & Measures

Phone (916) 875-6603

4137 Branch Center Road ♦ Sacramento, California 95827-3897

Fax (916) 875-6150

July 15, 1997

To whom it may concern:

Eradication of water hyacinth from the Sacramento/San Joaquin River Delta region has been a coordinated effort over the last ten to fifteen years involving state, local and private resources to attempt to remove this menace from the waterways. In the last three years this pest weed has been introduced to the Stone Lakes Basin in southern Sacramento County.

Water hyacinth, (Eichornia crassipes), has proven to be a very troublesome weed, clogging waterways, destroying habitat for fish and water birds, blocking pump intakes for irrigation and flood control, and slowing water flow allowing mosquitos to breed and flourish. There has been a concerted effort coordinated by the California Department of Boating and Waterways to eradicate this troublesome pest. When the weed was first discovered in the Stone Lakes Basin, it was this agency, with the cooperation of affected land owners that launched the initial attack to prevent the pest from becoming established in the basin. Since that time, the Sacramento Regional County Sanitation District has taken the lead to eradicate water hyacinth from the Stone Lakes Basin, with the Department of Boating and Waterways concentrating their resources on adjacent areas to prevent re-introduction. It is only through this kind of coordinated effort that there is hope that eradication of water hyacinth from the Stone Lakes Basin and the rest of the Delta will be successful; and it is absolutely essential that this effort be successful.

If this effort should fail, the Stone Lakes Wildlife Refuge will suffer extreme habitat loss, making the area unsuitable for the water fowl that depend on the area as a winter resting area. The water hyacinth is so prolific that it would cover the entire water surface in one or two seasons. In addition, the connecting sloughs and drainages that provide both irrigation for agricultural crops, flood drainage in the winter, and year round recreational opportunities will become hopelessly clogged. Perhaps most importantly, this area would serve as a continuing source of contaminant for the Sacramento/San Joaquin Delta through both the Sacramento and San Joaquin river systems making the efforts to eradicate this pest from those areas hopeless. It is essential that these eradication efforts be coordinated with specific lead agencies taking responsibility for the geographic areas within their jurisdiction. The responsible lead agencies cannot be allowed to fail. They must continue to coordinate their effort and to enlist the aid and support of local land owners in the project. The Sacramento Regional County Sanitation District has adopted this role and has provided the necessary leadership over the last two years to make this program successful. If they are able to obtain the necessary funding to carry on their efforts, eradication is more than just possible, it is likely.

It is my hope that the Sacramento Regional Sanitation District will find the necessary funding to carry on this important eradication effort. It is my belief, that if they are able to continue, they will be successful in their eradication effort, to the benefit of the entire Delta Region and all who use or depend on it.

Sincerely,

A handwritten signature in cursive script, appearing to read 'F. Carl'.

Frank E. Carl
Agricultural Commissioner

SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT



S.R.W.T.P. Bufferlands
Attn: Bryan Young
8521 Laguna Station Road
Elk Grove, CA 95758-9550

July 21, 1997

8631
Bond Road
Elk Grove,
California
95624
Telephone
916.685.1022
Fax
916.685.5464

To whom it may concern:

I am writing this letter to provide an endorsement of support toward the continued efforts to eradicate water hyacinth in the Stone Lakes Basin and surrounding areas. Dense floating vegetation likely harbors adult mosquitoes and promotes larval mosquito development. This canopy prevents effective larval treatment and adult mosquito control is very difficult when it needs to be achieved over a waterway. Eradication of water hyacinth allows biological control measures such as mosquitofish to be more effective and can minimize the need for pesticides.

The efforts of all of the agencies involved has been incredible! It is a challenge to coordinate different agencies with different objectives to come together towards a common goal, but the effort regarding the water hyacinth eradication program has been impressive. It is a testament to the willingness of governmental agencies to work together to solve a problem that can benefit all concerned.

A special thanks should be granted to the Sacramento Regional County Sanitation District, which has taken on the responsibility of coordinating all the efforts of the participating agencies. It has been through their diligence and direction that the efforts to date have been so successful. We intend to continue doing our part by providing personnel and equipment when it is feasible for us to do so.

Please inform us as to the status of this very important program. I can be reached at (916) 685-1022 ext. 559 if you need further information regarding our support.

MANAGER
David Brown

1997
BOARD OF TRUSTEES
Raul DeAnda, *President*
West Sacramento
Vern C. Bruhn, *Vice President*
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Cedro Casado
Galt
Rosemarie Butler
Ilwaco
Frank L. Lang
Yolo County
John L. Lewallen
Sacramento County
Richard L. Walker
Woodland
Robert K. Washino
Davis

Sincerely,

David Brown
David Brown
Manager

WATER HYACINTH ERADICATION PROGRAM

July 21, 1997

To Whom It May Concern

This letter is intended to explain the need to pursue the eradication of water hyacinth in Stone Lake and its tributaries.

For the past fifty-one years I have lived on and owned a farming operation at Stone Lake. Throughout the fifty-one year period we have observed intrusion of a number of various water plants which covered small areas of water surface and clogged channels to some extent, but none even closely compared to the nearly total coverage we experienced in 1995 and 1996.

I observed a small number of water hyacinth plants entering Stone Lake through the Lambert Road Bridge/Floodgate Structure in late 1993. Not being familiar with this very destructive water plant I had little concern for the intrusion.

In 1994 the plants drifted about the lake and connecting channels. In 1995 it became well established in the lakes and channels to the north including Beach Lake, Morrison and Laguna Creeks. In August, September and October of 1995 the explosive growth proved the warm water with its high organic content was the fertile habitat for the plant to establish itself.

The result was clogged channels and ditches, several pumps were damaged, fish and wildlife were displaced and indigenous plants damaged and destroyed. In the summer of 1995 Valerie Van Way, water hyacinth control supervisor for the California Department of Boating and Waterways, came on the scene bringing a great deal of experience, knowledge and research to our serious situation.

Val and her people had been working to control the hyacinth problem in the South Delta and was a driving force in bringing the seriousness of the problem to the Sacramento County Board of Supervisors, Agriculture Commissioner, Resource Conservation District, U.S. Fish & Wildlife, County Public Works Department and private property owners.

All public agencies at the urging of Supervisor Don Nottoli mounted an effort with funding directed through S.R.C.S.D Bufferlands as the lead agency. In my many years of dealing with government agencies I have never seen a better cooperative effort between government and the private sector.

While the very successful eradication effort in the summer of 1996 and flood of January 1997 moved the bulk of hyacinth out of the waterways a small number of plants

Page 2
Water Hyacinth
July 21, 1997

remained in all areas. To date, spot spraying of the remaining plants in the waterways has kept the growth to a minimum, but there still remain many isolated small patches of hyacinth which will provide a new seed supply when high water again covers these areas and distributes this seed along the waterways.

A lead agency is therefore needed to continue the eradication effort for as much as 5 years or more at an ever decreasing rate.

I will continue a personal effort to control the hyacinth growth on my private property and its perimeter. Also, as a director of the Resource Conservation District I will keep my fellow directors informed and solicit their help in channeling funds and equipment to the continuing eradication campaign.

Sincerely,

A handwritten signature in cursive script that reads "Galen Whitney". The signature is written in dark ink and is positioned above the printed name.

Galen Whitney

LARUE SCHOCK
10808 Stone Lake Rd.
Elk Grove, CA 95758
(916)-775-1334

To whom it may concern,

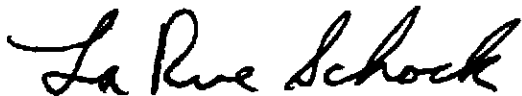
In this letter, I would like to explain the critical importance of controlling and eliminating water hyacinth from the Stone Lakes waterway system.

I live and farm on these waterways and when the water hyacinth began to clog our lake and channels, I naturally tried to control it. I tried removing it by hand and spraying it with herbicides, but I quickly lost the battle. Even with a new 55 gallon sprayer mounted in a boat, I could not keep up. I also tried removing hyacinth with a large excavator, but this only proved to be very expensive and not very effective.

Water hyacinth has an explosive growth rate. In a matter of weeks it can double and quadruple in size, adding tons and tons of material to the waterway. Uncontrolled, it will completely cover large areas of water surface. Once the water surface is covered it then begins to grow upwards, forming mats up to 8 feet thick. At this point, it is the effective end of the waterway for irrigation of crops, water conveyance for flood control, and usefulness for wildlife.

With all our cooperative efforts (especially SRCSD) and with nature's help (a large 1996/1997 flood event), we have an excellent opportunity to control this very invasive plant. However, to accomplish this goal, it will take a serious ongoing eradication program.

Sincerely,



LaRue Shock

July 27, 1997

TO WHOM IT MAY CONCERN

SUBJECT: Water Hyacinth Eradication Program (Grant)

The major water transfer system is the center area of the Sacramento River Delta between the community of Hood to the City of Isleton.

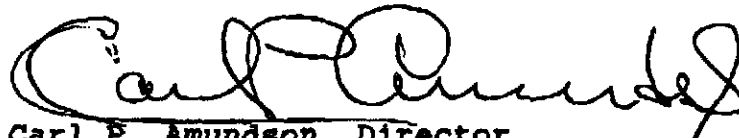
Through the years the creeks and smaller channels have become clogged with this voracious water weed (known as water hyacinth). This water plant reseeds every 26 days and it has a prolonged growing period. Only a major freeze will kill the plant.

The eradication program was started two years ago by volunteers and local government agencies. This joint venture has been extremely successful which demonstrates that this combination work force can be beneficial to the entire system of waterways.

In our judgement it is imperative that we keep this program going in order to keep the water ways free from this plant.

Grant funding is needed to keep this plant in check or we once again will see clogged waterways which restrict irrigation systems. This weed adversely affects a variety of businesses such as boating, fishing, the ECOS systems and agriculture. We must keep the water flowing freely in the Delta area.

Thank you.



Carl P. Amundson, Director
Florin Resource Conservation District

DEPARTMENT OF BOATING AND WATERWAYS

1629 S STREET
SACRAMENTO, CA 95814-7291
(916) 322-1808 FAX 322-1831



TO WHOM IT MAY CONCERN

July 22, 1997

On behalf of the California Department of Boating and Waterways (DBW) Aquatic Weed Control Program, I would like to commend the Sacramento Regional County Sanitation District (SRCSD) for its efforts to control waterhyacinth growth in Stone Lakes National Wildlife Refuge, and to declare solid support for its bid to intensify the effort and possibly eliminate the weed altogether.

Waterhyacinth is seriously detrimental to wetland habitat, impairing nearly all beneficial uses of the water, including water conveyance and flood control, wildlife and aquatic habitat, agricultural irrigation, and recreation such as fishing, hunting, boating and waterskiing. Waterhyacinth also serves as a habitat for mosquito populations and their associated diseases.

Up until the summer of 1996, ad hoc waterhyacinth control activities were intense but inefficient. Since taking the lead last year, the SRCSD, with a cooperative coalition of federal, state and local agencies and private parties, brought the waterhyacinth population to a manageable level. The SRCSD has proved so effective to date that DBW believes it should be the lead agency to bring about successful eradication, if feasible.

DBW believes waterhyacinth can be eradicated in the Stone Lakes Refuge because the infestation is geographically limited, does not reinfest from upstream, and the landowner base supports the use of effective integrated methods available to control it. Resources needed are basically for manpower to intensify a coordinated program of chemical treatment and physical removal.

Complete removal of hyacinths would benefit efforts of restoring the wetlands and its natural diversity as originally intended by all the cooperating agencies. Cost benefits will be realized with implementation of a low maintenance control program after initial steps of mapping, acquiring spray equipment and reducing the current biomass levels.

DBW will continue to support SRCSD and other program participants in their efforts to rid Stone Lakes of waterhyacinth and restore this wetland habitat to its natural state.

Sincerely,

A handwritten signature in black ink that reads "Valerie Van Way".

Valerie Van Way
Aquatic Pest Control Supervisor
Water Hyacinth Control Program

Appendix D -

Local Businesses Which have Pledged to Assist in the Dispersal of Educational Materials

Name of Business	Contact	Phone Number
Auburn Outboard Marine	Matt	652-1660
Boathouse Marine Repair	Kurt	776-2028
Brother's Boats	Chris	393-2628
California Custom Marine	Jim	646-1234
Cliff's Marina	Alvin	665-1611
Cornflower Farms	Ann	689-1015
Fisherman's Warehouse	Cynthia	362-1200
Flora Tropicana Aquatic Plant Nursery	Marco	362-6074
Fly Fishing Specialties		366-9252
Freeport Marina	Susan	665-1555
Freeport Bait	Reggie	665-1935
Just Fishin'	Lorraine	485-3474
Page's Fountains and Water Gardens	Ron	331-7205
Penny Rod and Bait	Ed	372-8813
Sherwood Harbor Marina	Linda	371-3471

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

Sacramento Regional County Sanitation District

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on this date and in the county below, is made under penalty of perjury under the laws of the State of California.

JANET H. WARRINGTON, ADMINISTRATIVE SERVICES OFFICER

OFFICIAL'S NAME

DATE EXECUTED

7/29/07

EXECUTED IN THE COUNTY OF

Sacramento

PROSPECTIVE CONTRACTOR'S SIGNATURE

PROSPECTIVE CONTRACTOR'S TITLE

Natural Resource Specialist

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

Sacramento Regional County Sanitation District